Title: Status of Federally Listed Threatened and Endangered Species at Los Alamos National Laboratory

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Status of Federally Listed Threatened and Endangered Species at Los Alamos National Laboratory

Los Alamos
NATIONAL LABORATORY

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Los Alamos Field Office

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CONTENTS

Figures

Tables

Acronyms

AEI	area of environmental concern
Bd	*Batrachochytrium dendrobatidis*
GPS	global positioning system
HMP	*LANL Threatened and Endangered Species Habitat Management Plan*
LANL	Los Alamos National Laboratory
PDSI	Palmer Drought Severity Index
USFWS	U.S. Fish and Wildlife Service

1 INTRODUCTION

Los Alamos National Laboratory (LANL) contains suitable habitat for three species protected under the Endangered Species Act: Mexican Spotted Owl (*Strix occidentalis lucida*), Jemez Mountains Salamander (*Plethodon neomexicanus*) and Southwestern Willow Flycatcher (*Empidonax traillii extimus*). Two other species are found nearby and are managed for any potential impacts. These species are the western distinct population segment of the Yellow-billed Cuckoo (*Coccyzus americanus*) and the New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*).

The three species with suitable habitat are surveyed for annually. These surveys follow the required federal survey protocols for each species and are performed by federally permitted biologists. This 2021 biennial report details survey results and other actions related to endangered species management at LANL.

2 HABITAT MANAGEMENT PLAN

Compliance with the Endangered Species Act at LANL is achieved through the implementation of the *LANL Threatened and Endangered Species Habitat Management Plan* (HMP; LANL 2017a). This plan is a formal agreement between the U.S. Department of Energy/National Nuclear Security Administration and the U.S. Fish and Wildlife Service (USFWS) for the management of endangered species and their habitats at LANL (Cons. #2-22-98-I-336 and Cons. #2-22-95-I-108). All actions and activities are reviewed for compliance with the HMP; if they meet the requirements in the HMP, then the work may proceed. Actions or activities that cannot follow the HMP requirements must go through individual Section 7 consultations. The controls for Endangered Species Act compliance are incorporated into an internal project review process through which all LANL projects are reviewed for environmental compliance (LANL 2020a).

3 COMPLIANCE ACTIONS

Since the last version of this report in 2019 (LANL 2019a), five biological assessments were completed for actions not covered in the HMP.

- *Modernization and Development of the Weapons and Facility Operation's High Explosive Testing and Processing Facilities* (LANL 2019b; 02ENNM00-2019-I-1378). The goal of this consultation was to allow for continued development of land for use by Weapons and Facility Operations, which will permit modernization of the current suite of buildings in use and new development to accommodate the LANL primary mission and national security responsibilities.
- *Construction of a New Multistory Parking Structure at Technical Area 50* (LANL 2020b; 02ENNM00-2020-I-0431). The goal of this consultation was to allow for additional and upgraded parking infrastructure at LANL to alleviate a current chronic parking shortfall along Pajarito Road.
- *Potential Effects of the Decommissioning and Demolition of the Ice House Building and the Reinforcement of Omega Road* (LANL 2020c; 02ENNM00-2020-I-0304). The goal of this consultation was to reinforce sections of Omega Road in Los Alamos Canyon to support the use

of heavy equipment vehicles needed for decommissioning and demolition work of the Ice House building.

- *Potential Effects from the Construction of Two Office Buildings within Technical Area 35* (LANL 2020d; 02ENNM00-2020-I-1412). The goal of this consultation was to allow for decommissioning and demolition work of one building, followed by land clearing and grubbing, importing fill material, land leveling and compaction, utility installation, and foundation construction for the siting of two modular buildings.
- *Amendment for the Modernization and Development of the Weapons and Facility Operation's High Explosive Testing and Processing Facilities* (LANL 2021; 02ENNM00-2019-I-1378-R001). The goal of this consultation was to account for additional construction and re-siting of previously identified buildings for use by Weapons and Facility Operations.

4 MITIGATION ACTIONS

Projects are not required to make in-kind remediation of habitat for the species that are being impacted; therefore, mitigations that benefit any of the three federally listed species that occur at LANL are acceptable.

As part of the aforementioned consultations, mitigation actions were required. A restoration planting effort was conducted within a Mexican Spotted Owl area of environmental interest (AEI) in 2020. The area was selected due to a significant die-off of pine trees after wildfires and drought. The trees were given supplemental water to aid in their establishment and growth.

5 SPECIES INTRODUCTION

The LANL HMP includes federally protected species under the Endangered Species Act that occur on or near LANL property. The HMP requires surveys to be conducted either annually or as needed depending on the species for species with suitable habitat.

5.1 MEXICAN SPOTTED OWL

5.1.1 *General Biology*

The Mexican Spotted Owl is one of three subspecies of spotted owl found in North America. The Mexican Spotted Owl is a pale gray-chestnut brown color with white and brown spots on the abdomen, back, and head; its tail is brown with thin white bands; and its ears lack tufts. The Mexican Spotted Owl is one of only a few owl species in the United States that has dark eyes. Owls younger than 5 months have a downy appearance. Females are larger than males (USFWS 2012a).

The Mexican Spotted Owl is found in northern Arizona, southeastern Utah, southwestern Colorado, New Mexico, west Texas, and into Mexico. It is the only subspecies of Spotted Owl recognized in New Mexico (USFWS 2012a). The Mexican Spotted Owl generally inhabits mixed conifer and ponderosa pine (*Pinus ponderosa Lawson & C. Lawson*) and Gambel oak (*Quercus gambelii Nutt.*) forests in mountains and canyons. Characteristics of Mexican Spotted Owl habitat include high canopy closure, high stand diversity, and multi-layered canopy resulting from an uneven-aged stand, large mature trees, downed logs, snags, and stand decadence, as indicated by the presence of mistletoe (*Arceuthobium spp.*).

Some Mexican Spotted Owls have been found in second-growth forests, i.e., younger forests that have been logged; however, these areas were found to contain characteristics typical of old-growth forests. No Mexican Spotted Owls were found in forests less than 36 years of age (USFWS 2012a). Mexican Spotted Owls in the Jemez Mountains seem to prefer cliff faces in canyons for their nest sites (Johnson and Johnson 1985). The young leave the nest at 32 to 36 days old to perch on surrounding branches and can fly short distances at 40 to 45 days. Survival rate for the young is low. The recovery plan for the Mexican Spotted Owl recommends that mixed conifer and pine-oak woodland types on slopes greater than 40 percent be protected for the conservation of this owl (USFWS 2012a). Although seasonal movements vary among owls, adults commonly remain within their summer home ranges throughout the year.

Under the HMP, Mexican Spotted Owl habitat was modeled at LANL based on a combination of topographical features and macro-level vegetation classifications. Areas defined as suitable Mexican Spotted Owl habitat were delineated into AEIs during the development of the HMP in 1998. LANL biologists have since developed a Mexican Spotted Owl habitat model that incorporates finer-scale vegetation characteristics into the current model (Hathcock and Haarmann 2008). A version of this model was used to update the AEIs at LANL, and the proposed changes received concurrence from the USFWS in 2005 (LANL 2005). The current Mexican Spotted Owl AEI inventory consists of five AEIs that span seven canyons at LANL.

5.1.2 *Conservation History and Current Status*

On December 30, 1982, a USFWS status review of vertebrate taxa led to the consideration of adding the Mexican or "Southern" Spotted Owl to the Endangered Species Act list of threatened or endangered species (USFWS 1982). On November 3, 1991, the USFWS proposed listing the Mexican Spotted Owl as a threatened species under the Endangered Species Act (USFWS 1991). The Mexican Spotted Owl was listed as a threatened species under the Endangered Species Act on March 16, 1993 (USFWS 1993). Critical habitat was established on August 31, 2004 (USFWS 2004). The first recovery plan for the Mexican Spotted Owl was approved in 1995 (USFWS 1995a). The plan was updated in 2012 (USFWS 2012a). A 5-year status review was initiated in February 2013 (USFWS 2013a) and found no change to its status.

5.1.3 *Survey Methods*

Federal permits are required before performing surveys. Three primary calling techniques can be used to survey for the Mexican Spotted Owl. The choice of calling technique is based on the best way to cover all suitable habitats. The three calling methods are point, continuous, and leapfrog technique. LANL biologists use the point-method survey technique.

In the point-method survey technique, an electronic recording of a male or female owl call is played using a handheld game caller (or a surveyor may imitate vocal calls of the owl) at a fixed point. The observer spends at least 15 minutes at a point and alternates between playing the recording of the owl and listening for a response. In canyon habitat, surveyors spend a minimum of 20 minutes at each station. The primary four-note location call of the Mexican Spotted Owl is the major call played during surveys. Points are approximately 0.5 mi (0.8 km) apart and cover all suitable habitats.

Surveys are conducted annually in all Mexican Spotted Owl AEI core areas on LANL property. Four surveys are conducted in each AEI between late March and August 31 of any given year unless a Mexican Spotted Owl is found. No more than one survey is conducted in March of any given year. A minimum of

two surveys are completed before July 1 of any given year. Surveys are at least 5 days apart and are initiated either before sunrise or the 2 hours after sunset. Field surveys are not conducted during existing or predicted wind >15 mph (>24.1 km) or during stormy weather. Surveys are not conducted when access problems occur due to snow or poor road conditions.

5.1.4 *History of Results*

Surveys for Mexican Spotted Owls have been conducted on LANL property since 1994. In 1995, a pair of Mexican Spotted Owls and their nest were located in Cañon de Valle. The nesting territory was occupied from 1995 through 2011, and young have fledged in multiple years. In 2004, 2005, and 2006, a territory in Mortandad Canyon was occupied by at least one Mexican Spotted Owl. This area was re-occupied in 2013 and continues to be occupied to date with a pair of owls. In 2007, LANL biologists located a pair of Mexican Spotted Owls and their nest in Three Mile Canyon. This site has been occupied each year since, and young have fledged in multiple years. A history of the Mexican Spotted Owl survey results since surveys began in 1994 is detailed in Table 5-1. LANL biologists started conducting surveys within Acid Canyon (a canyon within the township of Los Alamos) after hearing reports that local bird enthusiasts were observing Mexican Spotted Owls in that canyon. Surveys conducted in 2016 and 2017 determined that the Mexican Spotted Owls in Acid Canyon were not breeding and that the owls were thought to possibly be siblings. One Mexican Spotted Owl was found dead in nearby Pueblo Canyon in 2017, likely the result of depredation by a Great Horned Owl (*Bubo virginianus*). The dead owl was transferred to the USFWSs species lead, Shaula Hedwall, in September 2017. In January 2018, a second Mexican Spotted Owl was found dead in Pueblo Canyon near the confluence with Acid Canyon. This owl carcass was also transferred to Shaula Hedwall in February 2018. Additional sightings by birders in Acid/Pueblo Canyons were reported in 2020 and 2021, although no breeding attempts were observed during these 2 years. No further surveys have been conducted within these canyons.

Table 5-1. Mexican Spotted Owl Survey Results at LANL

Year	Cañon de Valle	Water Canyon	Three Mile Canyon	Pajarito Canyon	Mortandad Canyon	Sandia Canyon	Los Alamos Canyon
1993	—	—	—	N	—	—	—
1994	—	—	—	—	—	—	N
1995	P+(2)	N	N	N	—	—	N
1996	P+(2)	N	N	N	—	—	N
1997	P	N	—	—	—	—	N
1998	P+(2)	N	—	—	N	N	N
1999	P+(2)	N	N	N	N	N	N
2000	P	N	N	N	N	N	N
2001	P	N	N	N	N	N	N
2002	P	N	N	N	N	N	N
2003	P	N	N	N	N	N	N
2004	P	N	N	N	P*	N	N
2005	P+(3)	N	N	N	P*	N	N
2006	P	N	N	N	P*	N	N
2007	P	N	P+(3)	N	N	N	N
2008	P	N	P	N	N	N	N
2009	P+(2)	N	P+(1)	N	N	N	N
2010	P	N	P	N	N	N	N

Year	Cañon de Valle	Water Canyon	Three Mile Canyon	Pajarito Canyon	Mortandad Canyon	Sandia Canyon	Los Alamos Canyon
2011	P	N	P	N	N	N	N
2012	N	N	P+(1)	N	N	N	N
2013	N	N	P+	N	P+	N	N
2014	N	N	P	N	P	N	N
2015	N	N	P+(4)	N	P+(3)	N	N
2016	N	N	P	N	P+(2)	N	N
2017	N	N	P+(2)	N	P	N	N
2018	N	N	P	N	P	N	N
2019	N	N	P+(3)	N	P+(1)	N	N
2020	N	N	P+(3)	N	P+(2)	N	N
2021	N	N	P	N	P	N	N

— = No data; N = Negative survey; P = Positive survey; + = Breeding confirmed (# of young seen); * = A single owl

5.1.5 *Additional Data Analysis*

Increases in the frequency, duration, and severity of drought associated with a changing climate could have cascading effects on bird productivity (Saracco et al. 2018). In our region of the country, Saracco et al. (2018) documented avian productivity declines as a function of relative spring drought severity. Therefore, we anticipated a negative relationship between indicators of drought and the number of young fledged for Mexican Spotted Owl pairs at occupied locations. To assess the influence of drought on Mexican Spotted Owl productivity, we investigated whether regional climatic conditions were correlated with successful breeding of Mexican Spotted Owls at LANL. We theorized that spring drought severity would influence reproductive productivity.

5.1.5.1 Methods

Data were compiled from surveys and number of owls fledged from 1994 to 2021. The Palmer Drought Severity Index (PDSI) uses readily available temperature and precipitation data to estimate relative dryness (Dai et al. 2019). This standardized index spans −10 (dry) to 10 (wet) and has been reasonably successful at quantifying long-term drought. Drought categories include no drought (greater than −1.0) abnormally dry (−1.0 to −1.9), moderate drought (−2.0 to −2.9), severe drought (−3.0 to −3.9), extreme drought (−4.0 to −4.9), and exceptional drought (−5.0 and less). For analyses, we used PDSI monthly data from the United States Climate Division 2 of north central New Mexico (NOAA 2021) and averaged the monthly index (December–May) for each year. We speculated that this period would best reflect the conditions to which Mexican Spotted Owls respond during the breeding season. We used a mixed-effects regression model to test the influence of drought (PDSI index values) on productivity (the number of young fledged). Because Mexican Spotted Owls, in general, show high mate and site fidelity (Bond et al. 2002), pairs of owls were assumed to be the same if they occupied the same site year after year. “Pair” was used as a random effect in the model to control for repeated measures (years) on one subject (pair of owls). We used the lme4 package (Bates et al. 2015) in the R statistical software version 4.1.0 for all data analyses (R Core Team 2019).

5.1.5.2 Results

PDSI values ($\mu = -0.69$, range = −5.66, 4.16) and number of fledged young ($\mu = 0.95$, range = 0, 4) from occupied sites were compiled from 1994 to 2021 (Figure 5-1). We broke these data into five different

drought categories and visually assessed how many young were produced during the different drought categories for all years (Figure 5-2). The number of fledged young showed a positive association with the PDSI (R2 = 0.12, P = 0.012) (Figure 5-3).

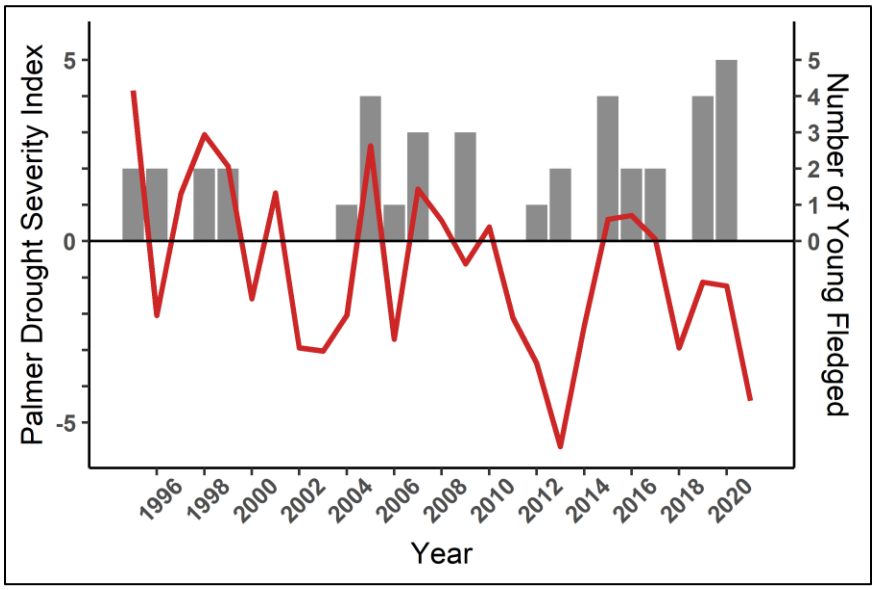

Figure 5-1. Palmer Drought Severity Index and number of fledged young from 1995 to 2021.

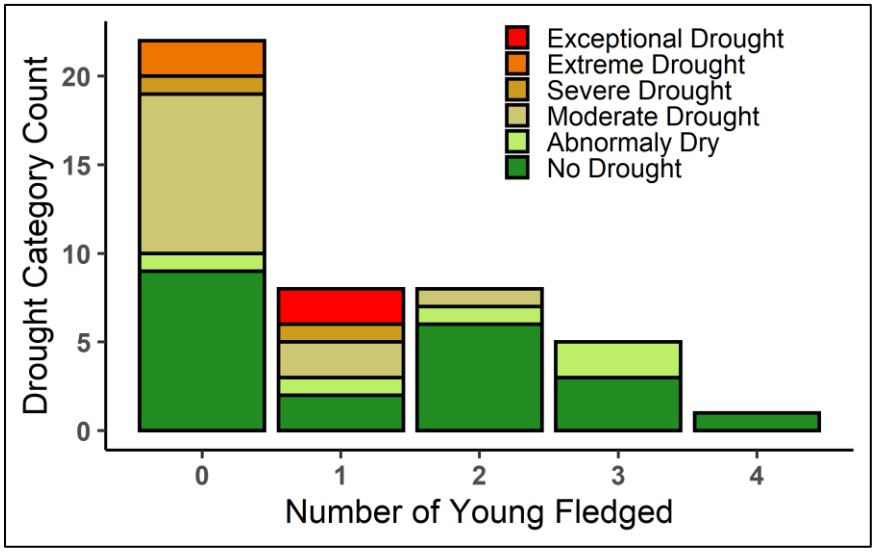

Figure 5-2. Count of five different drought categories and number of fledged young from 1995 to 2021.

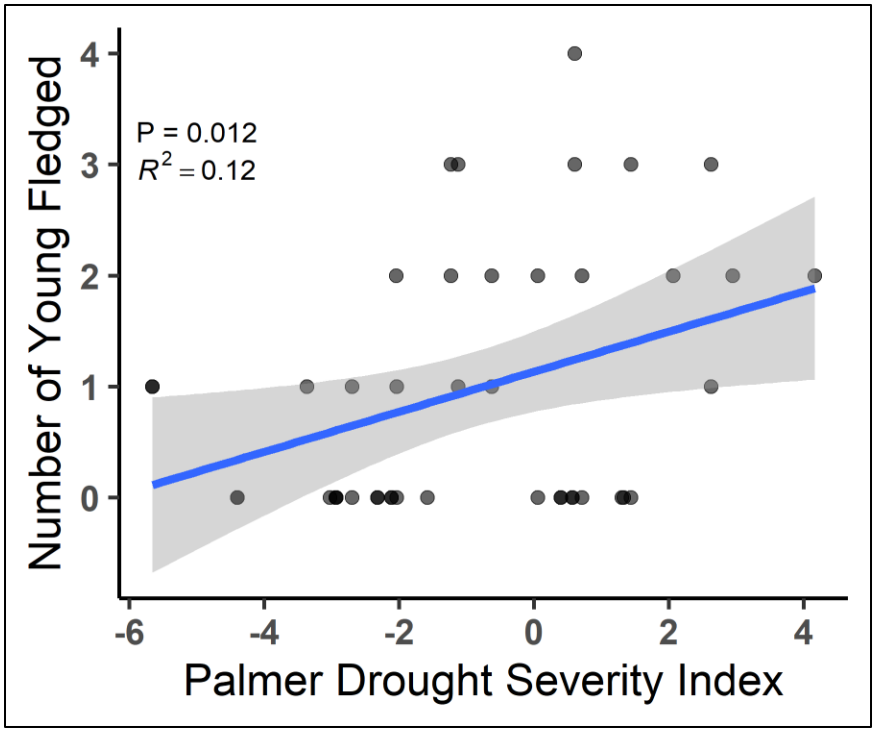

Figure 5-3. Scatter Plot showing number of fledged young relative to the Palmer Drought Severity Index, 95% confidence intervals are shown as shaded areas.

5.1.5.3 Discussion

Drought is a high-order phenomenon that has cascading effects on habitat suitability and prey base that can affect reproductive output of an animal. Our results suggest that more-severe drought conditions could lead to less productivity for the Mexican Spotted Owls on LANL property. Similarly, a study on a population of California Spotted Owls (*Strix occidentalis occidentalis*) indicated that drier-than-average years were related to a reduction in reproduction in portions of their range (LaHaye et al. 2004). Annually averaged PDSI values for 2013 in the southwestern United States were the driest on record in the last 123 years (NOAA 2021). Similarly low PDSI values occurred concomitantly with low productivity years for the Mexican Spotted Owl (Figure 5-1). Predicted increases in the drought severity could affect many components of the forest ecosystem in our region. As such, severe drought conditions will likely continue to negatively impact the reproductive output of Mexican Spotted Owls into the future.

5.2 JEMEZ MOUNTAINS SALAMANDER

5.2.1 *General Biology*

The Jemez Mountains Salamander is one of two species of plethodontid (lungless) salamanders endemic to New Mexico. The species can be found in the Jemez Mountains in north-central New Mexico in Los Alamos, Rio Arriba, and Sandoval counties (Stebbins and Riemer 1950). The Jemez Mountains Salamander occurs at elevations between 6,988 to 11,254 ft. (2,130 to 3,430 m) in mixed-conifer forest that consists primarily of Douglas fir (*Pseudotsuga menziesii Mirb.*), blue spruce (*Picea pungens Engelm.*), Engelmann spruce (*Picea Engelmannii Parry*), white fir (*Abies concolor Gord.*), limber pine (*Pinus flexilis E. James*), ponderosa pine, Rocky Mountain maple (*Acer glabrum Torr.*), and aspen

(*Populus tremuloides Michx.*; Degenhardt et al. 1996). Although pure stands of ponderosa pine may not be considered ideal habitat, the species has occasionally been found in this forest type. The species has also occasionally been found in spruce-fir and aspen stands and high-elevation meadows.

The Jemez Mountains Salamander spends most of its life underground but can be found at the surface when conditions are warm and wet, typically from July through September. Occasional salamander observations have been made during May, June, and October (USFWS 2013b). When on the surface, the species usually is found under decaying logs, rocks, bark or moss mats, or inside decaying logs or stumps. The salamander is strictly terrestrial and does not use standing surface water for any life stage. Respiration occurs through the skin, which requires a moist microclimate for gas exchange. The Jemez Mountains Salamander is uniformly grayish dark brown above (dorsal side), with occasional gold stippling and sooty gray below (ventral side). The salamander is slender and elongate, and it possesses foot webbing and a reduced fifth toe. The average Jemez Mountains Salamander is approximately 3.2 in. (82 mm) in total length; eats invertebrates including ants, mites, and beetles; and is thought to lay its eggs underground (USFWS 2013b).

5.2.2 *Conservation History and Current Status*

The Jemez Mountains Salamander was listed in New Mexico as endangered under the Wildlife Conservation Act of New Mexico in 2006 (NMDGF 2006). In September 2012, the USFWS proposed the Jemez Mountains Salamander as endangered under the Endangered Species Act (USFWS 2012b). The final listing of the Jemez Mountains Salamander as federally endangered under the Endangered Species Act was issued September 10, 2013 (USFWS 2013b). On November 20, 2013, the USFWS issued the designation of critical habitat for the Jemez Mountains Salamander (USFWS 2013c).

5.2.3 *Survey Methods*

The survey techniques for the Jemez Mountains Salamander were developed jointly between the New Mexico Department of Game and Fish and the USFWS. Federal and state permits are required before conducting surveys. The Jemez Mountains Salamander visual encounter surveys consist of three-person hour surveys or until first detection of the species. A moisture assessment of the survey area is required before all surveys to determine if conditions are suitable for salamander surface activity. It is recommended that surveyors look under 10 cover objects to assess moisture levels. If soil is dry to the touch, do not survey. If soil is moist to the touch, then proceed with the survey.

Current weather, soil moisture, soil pH, and soil temperature data are collected before the salamander survey begins. Once conditions are determined to be suitable for a salamander survey, the three-person hour survey begins. One individual is the center point and lead for the survey and is responsible for tracking time; the remaining surveyors are spaced approximately 30 ft (9 m) apart in a line. Global positioning system (GPS) coordinates for the initial survey point, midpoint, and conclusion of the area surveyed are collected. All cover objects are turned over and then placed back into their former position. If a salamander is found, the person who captures the salamander should shout “Salamander!” to notify the remaining survey crew to stop surveying. The salamander is immediately placed into a plastic bag with a small amount of water. A small spray bottle of distilled water can be useful for moistening the salamander. Morphological measurements (snout-vent-length, total length, and tail condition) and microhabitat data (i.e., cover object type and size, soil temperature, soil pH, and current weather conditions) are recorded. All salamanders are swabbed on their ventral (bottom) side approximately 30 times, making sure to swab the cloaca (vent) area well and the bottom of the feet approximately 10 times

for *Batrachochytrium dendrobatidis* (Bd) pathogen sampling. GPS coordinates are collected at the salamander location. The USFWS recommends that repeat salamander surveys be conducted at the same site within a survey season. To prevent inadvertent movement of disease or parasitic organisms among sites, field equipment and boots are cleaned and disinfected in accordance with the disinfection protocols provided by the USFWS.

5.2.4 *History of Results*

Before being listed as endangered under the Endangered Species Act in 2013, two Jemez Mountains Salamander locations were documented at LANL. Surveys were conducted in 1985 and began again in 2007. The salamander was documented in Los Alamos Canyon—east of the Omega Bridge—by Ramotnik (1986) and west of the bridge by Hathcock (LANL 2008). In 2014, Jemez Mountains Salamander surveys were conducted in Los Alamos Canyon, Cañon de Valle, and around the Fenton Hill facility; no salamanders were detected. In 2015, Jemez Mountains Salamander surveys were conducted in Los Alamos Canyon, Two Mile Canyon, and around the Fenton Hill facility; two salamanders were found in Los Alamos Canyon. A history of Jemez Mountains Salamander survey results is detailed in Table 5-2.

Table 5-2. Jemez Mountains Salamander Survey Results at LANL

Year	Los Alamos Canyon	Pajarito Canyon	Two Mile Canyon	Cañon de Valle	Fenton Hill
1985	P	—	N	N	N
2008	P	—	—	—	—
2009	—	—	—	—	—
2010	—	—	N	—	—
2011	—	—	—	—	—
2012	—	—	—	—	N
2013	—	—	—	—	N
2014	N	—	—	N	—
2015	P	N	N	—	N
2016	—	—	—	—	—
2017	—	—	—	—	—
2018	—	—	—	—	—
2019	N	—	—	—	—
2020	—	—	—	—	—
2021	N	—	—	—	—

— = No data; N = Negative survey; P = Positive survey

In 2016 and 2017, surveys were conducted within and around the footprint of the paleoseismic trenching investigation on U.S. Forest Service lands to the west of LANL. One salamander was found within a planned access route for the project in 2016. Due to logistical and cost concerns, other access routes were identified for the project. No salamanders were found during surveys in these areas in 2017. No surveys were conducted in 2018 or 2020 because conditions were not appropriate according to the survey protocol. In 2019, four surveys were completed in a small portion of the Los Alamos Canyon AEI for a potential project; those surveys were negative. Subsequent surveys in 2021 were negative.

5.2.5 *Disease*

One of the factors in the federal listing (USFWS 2013b) was risk to the Jemez Mountains Salamander from disease. The amphibian pathogenic fungus (Bd) was found in a Jemez Mountains Salamander in 2003 (Cummer et al. 2005) on the east side of the species' range and again in another salamander in 2010 on the west side of the species' range (USFWS 2013b). Because suitable conditions for conducting surveys for Jemez Mountains Salamander are seldom achieved, a proxy for assessing quality habitat available to Jemez Mountains Salamander may be to test for prevalence of Bd in other amphibian species in the Jemez Mountains. Therefore, LANL biologists have proactively been monitoring for Bd since 2007. In 2010, 2015, and 2016, a total of four Jemez Mountains Salamanders found on or near LANL were swabbed for Bd, and test results from Pisces Molecular, LLC, laboratory were negative. Various other amphibians have been swabbed since 2007, and all were negative for Bd.

In a separate study in 2015, 10 larval stage (neotenic adult and juvenile) Tiger Salamanders (*Ambystoma tigrinum*) were collected from the Milagro Pond at Technical Area 57. They were anesthetized and euthanized. Swab samples were taken on the outer dermis and also on all mouth parts to examine whether larval stage Tiger Salamanders have enough keratin in their outer dermis (compared with keratinized mouth parts) to be able to detect Bd. All 20 swabs were negative for Bd. Tissue samples were also collected from all 10 Tiger Salamanders and were tested for ranavirus, another amphibian pathogen; these results were also negative. One swab sample was collected from a Canyon Tree Frog (Hyla arenicolor) in 2018; it was negative. Swabs collected from Tiger Salamanders in 2019 have been analyzed, and all results were negative for the presence of Bd. One Jemez Mountains Salamander caught in 2021 was swabbed, and results are pending. A total of 97 samples collected from around the greater Jemez Mountains area have been sent for analysis, and all were negative for Bd and/or ranavirus. Continued and more extensive sampling is needed to monitor for Bd at LANL.

5.3 SOUTHWESTERN WILLOW FLYCATCHER

5.3.1 *General Biology*

The Southwestern Willow Flycatcher is a small migratory bird about 6 in. (15 cm) long with gray-green back and wings, white throat, gray-olive breast, and pale-yellow belly. It also has two obvious pale wing-bars but lacks the conspicuous pale eye-ring of many similar *Empidonax* species. While perched, the Southwestern Willow Flycatcher characteristically flicks its tail slightly upward. It is best identified by vocalizations. The primary song, consisting of fitz-bew, can be interspersed with britt notes (USFWS 2002). The Southwestern Willow Flycatcher is found in close association with dense stands of willows (*Salix L.*), arrowweed (*Pluchea spp.*), buttonbush (*Cephalanthus occidentalis L.*), tamarisk (*Tamarix L.*), Russian olive (*Elaeagnus angustifolia L.*), and other riparian vegetation, often with a scattered overstory of cottonwood (*Populus L.*; USFWS 2002). The size of vegetation patches or habitat mosaics used by the Southwestern Willow Flycatcher varies considerably and ranges from as small as 2 ac (0.8 ha) to several hundred acres. The Southwestern Willow Flycatcher nests in thickets of trees and shrubs approximately 6.5 to 50 ft (2 to 15 m) tall, with a high percentage of canopy cover and dense foliage from 0 to 13 ft (0 to 4 m) above ground. Regardless of the plant species composition or height, occupied sites always have dense vegetation in the patch interior (Sogge et al. 2010).

5.3.2 *Conservation History and Current Status*

The Southwestern Willow Flycatcher was given a status review and possible listing as an endangered or threatened species on September 1, 1992 (USFWS 1992). The review was proposed due to serious population declines, historical and present habitat destruction, and inadequate regulatory protections. The Southwestern Willow Flycatcher was given full protection under the Endangered Species Act as endangered on February 27, 1995 (USFWS 1995b). The listing also received revisions to critical habitat on January 3, 2013 (USFWS 2013d). The Southwestern Willow Flycatcher is known to have breeding territories in all states of its historical range except Texas; however, its continued existence is in jeopardy due to continued riparian habitat reduction, degradation, and elimination caused by land and water management actions associated with agricultural and urban development. Other threats include predation, cowbird (*Molothrus spp.*) brood parasitism, and naturally occurring fires and floods that have become more frequent and intense as a result of the proliferation of exotic vegetation and degraded watersheds (USFWS 2002).

5.3.3 *Survey Methods*

Federal permits are required before performing surveys. The survey methods for documenting the presence/absence of Southwestern Willow Flycatchers rely on broadcast call-playback technique. An electronic recording of a Willow Flycatcher is played to elicit a response from a territorial bird, thereby increasing the detectability of a resident bird. Surveys should be initiated in the pre-dawn hours and continue until all suitable habitat has been covered, or until environmental factors or adverse anthropogenic sources hinder conducting a full and adequate survey. Additionally, one way to determine if flycatchers found at a particular site are migrants or territorial breeders is to find them present during the "non-migrant" period, which generally is from about June 15–July 20. A Willow Flycatcher found during this time probably is a territorial bird, although a small chance exists that it could be a non-territorial floater (Sogge et al. 2010). Differing numbers of visits must be conducted for general surveys versus project-related surveys, with a minimum of one survey within each of the three survey periods for general surveys. For project-related surveys, one survey within the first survey period must be conducted, and the second and third survey periods must each have two surveys conducted. Surveys must be conducted with at least 5 days between surveys. Survey periods are as follows: Survey Period 1 occurs May 15–31, Survey Period 2 occurs June 1–24, and Survey Period 3 occurs June 25–July 17.

5.3.4 *History of Results*

LANL biologists conduct surveys annually in the Sandia and Pajarito wetlands following linear transects. The Sandia Wetlands is not listed as an AEI for the flycatcher, and surveys in this area are not required but are conducted when time is available. Call-playback surveys have been conducted annually since 1995 in the Pajarito Wetlands and since 2014 in the Sandia Wetlands, and no Southwestern Willow Flycatchers have been found to be breeding in these areas. A Monitoring Avian Productivity and Survivorship banding station operated in the Sandia Wetlands since 2014 has captured multiple Willow Flycatchers of unknown subspecies during the spring migration period. A fall banding station operated since 2010 within the Pajarito Wetlands has captured multiple Willow Flycatchers of unknown subspecies during the fall migration period.

5.4 YELLOW-BILLED CUCKOO

5.4.1 *General Biology*

The Yellow-billed Cuckoo (*Coccyzus americanus*) is a neotropical migrant bird with a mostly yellow bill, brownish back, rufous wings, and all white underneath. In flight and when perched, large white spots and edging to tail feathers are prominent. The Yellow-billed Cuckoo is a riparian obligate species; therefore, it nests almost exclusively in low-mid elevation riparian/riverine habitat dominated by a cottonwood-willow matrix (Halterman et al. 2015). It is a late spring migrant, and therefore has one of the shortest nesting phases of any bird species. The cuckoo tends to time its breeding to coincide with locally abundant food supplies (Hughes 2015).

5.4.2 *Conservation History and Current Status*

The Yellow-billed Cuckoo was noted as declining in California as early as 1944 (Grinnell and Miller 1944). The Yellow-billed Cuckoo was first posted to the Federal Register for review of possible listing as an endangered or threatened species on December 30, 1982 (USFWS 1982). On October 3, 2013, the USFWS proposed listing the Western Distinct Population Segment of the Yellow-billed Cuckoo as threatened. Following multiple public comment periods and a proposal to designate critical habitat for the Yellow-billed Cuckoo, the USFWS designated it as a threatened species within the western United States, Canada, and Mexico (USFWS 2014a). The species is no longer thought to breed in western Canada or the northwestern continental United States areas of Washington, Oregon, and Montana (USFWS 2014a). On April 21, 2021, the USFWS issued the designation of critical habitat for the Yellow-billed Cuckoo (USFWS 2021).

5.4.3 *Survey Methods*

Surveys are conducted by permitted biologists along the Rio Grande on LANL's eastern boundary, following a continuous linear transect with a broadcast call-playback technique. A minimum of one survey per survey period must be conducted, with no fewer than 12 days and no more than 15 days between surveys in survey periods 1 and 3: Survey Period 1 occurs June 15–July 1, and Survey Period 3 occurs July 31–August 15. A minimum of two surveys must be conducted in Survey Period 2 (July 1–July 31). The surveys start at first light and continue until all points or suitable habitat have been covered. Special attention should be made to complete the survey route before 11:00 a.m. because activity levels decrease significantly after this time (Halterman et al. 2015). The survey protocol should consist of five contact calls, (e.g., kowlp) spaced one minute apart with an initial minute of listening for calls when arriving at survey points. Survey points should be approximately 328 ft (100 m) apart; however, if a cuckoo is identified at a survey point, the researcher should move at least 984 ft (300 m) away so an individual is not recounted.

5.4.4 *History of Results*

In 2016, LANL biologists surveyed a stretch of potential habitat along LANL's southern boundary; those surveys were negative for the cuckoo. No surveys were conducted during 2017–2021 due to the lack of a programmatic need for surveys. Only one account exists of a Yellow-billed Cuckoo within the section of the Rio Grande near LANL (BISON-M 2021).

5.5 NEW MEXICO MEADOW JUMPING MOUSE

5.5.1 *General Biology*

The New Mexico Meadow Jumping Mouse (*Zapus hudsonius luteus*) is endemic to the states of New Mexico, Arizona, and portions of southern Colorado (Hafner et al. 1981). The mouse is grayish-brown on the back, yellowish-brown on the sides, and white underneath. The species is about 7 to 10 in. (187 to 255 mm) in total length, with elongated feet and an extremely long, bicolored tail. It nests in dry soils but uses moist, streamside, and dense riparian/wetland vegetation up to elevations of about 8,000 ft (2,438 m; Frey 2006). The mouse appears to use only riparian community types that consist of persistent, emergent herbaceous wetlands such as beaked sedge (*Carex rostrata Stokes*) and reed canarygrass (*Phalaris arundinacea L.*) alliances and scrub-shrub wetlands such as riparian areas composed of willows and alders along perennial streams (*Alnus spp.*; Frey 2005). The mouse is generally nocturnal and occasionally diurnal. It is active only during the growing season of the grasses and forbs on which it depends, when the mouse accumulates fat reserves by consuming seeds and insects to sustain it through hibernation.

5.5.2 *Conservation History and Current Status*

The USFWS first proposed adding the mouse as a threatened or endangered animal on September 18, 1985 (USFWS 1985). On July 10, 2014, the New Mexico Meadow Jumping Mouse was given protection under the Endangered Species Act as an endangered species, with a final determination of critical habitat designated on March 15, 2016 (USFWS 2016).

5.5.3 *Survey Methods*

No formal survey methods approved by the USFWS exist at the time of this report.

5.5.4 *History of Results*

No records exist of the meadow jumping mouse from within the LANL boundary of Los Alamos County (BISON-M 2021, LANL 2009).

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